Prescribing Information

1. Product name

RITALIN® 10 mg Tablets

RITALIN® LA 10 mg, 20 mg, 30 mg and 40 mg Modified-Release Capsules

2. Qualitative and quantitative composition

Active substance

The active substance is methylphenidate hydrochloride (INN for alpha-phenyl-2-piperidine acetic acid methyl ester).

Ritalin tablet contains 10 mg methylphenidate hydrochloride.

Ritalin LA capsule contains 10mg, 20 mg, 30 mg and 40 mg methylphenidate hydrochloride.

Ritalin 10 mg tablets: each tablet contains 40 mg of lactose and 48 mg of wheat starch.

Ritalin LA 10 mg modified-release capsules: each capsule contains 61.39 mg sugar spheres.

Ritalin LA 20 mg modified-release capsules: each capsule contains 122.77 mg sugar spheres.

Ritalin LA 30 mg modified-release capsules: each capsule contains 184.15 mg sugar spheres.

Ritalin LA 40 mg modified-release capsules: each capsule contains 245.53 mg sugar spheres.

For the full list of excipients, see section 6.1.

3. Pharmaceutical form

Tablet 10 mg:

Immediate release 10mg tablets (divisible). A round, flat, white tablet with bevelled edges containing 10mg methylphenidate. Imprinted CG on one side and A/B with a score on the other. The tablet may contain dark specks.

LA Capsule 10 mg:

Modified-release hard capsule. White to off white beads that are roughly spherical in shape in a light brown and white capsule with imprint NVR and R10 in tan-coloured ink.

LA Capsule 20 mg:

Modified-release hard capsule. White to off-white beads that are roughly spherical in shape in a white capsule with imprint NVR and R20 in tan-coloured ink.

LA Capsule 30 mg:

Modified-release hard capsule. White to off-white beads that are roughly spherical in shape in a yellow capsule with imprint NVR and R30 in tan-coloured ink.

LA Capsule 40 mg:

Modified-release hard capsule. White to off-white beads that are roughly spherical in shape in a light brown capsule with imprint NVR and R40 in tan-coloured ink.

WARNING: ABUSE, MISUSE, AND ADDICTION
Ritalin has a high potential for abuse and misuse, which can lead to the development of a substance use disorder, including addiction. Misuse and abuse of CNS stimulants, including Ritalin, can result in overdose and death (see section 4.9 Overdose), and this risk is increased with higher doses or unapproved methods of administration, such as snorting or injection.
Before prescribing Ritalin, assess each patient's risk for abuse, misuse, and addiction. Educate patients and their families about these risks, proper storage of the drug, and proper disposal of any unused drug. Throughout Ritalin treatment, reassess each patient's risk of abuse, misuse, and addiction and frequently monitor for signs and symptoms of abuse, misuse, and addiction (see section 4.4 Special warnings and precautions for use).

4. Clinical particulars

4.1. Therapeutic indications

Attention deficit hyperactivity disorder (ADHD):

Ritalin 10 mg tablets

Ritalin LA modified-release capsules (10mg, 20mg, 30mg, 40mg)

Narcolepsy:

Ritalin 10 mg tablets only

General

Attention-Deficit/Hyperactivity Disorder (ADHD, DSM-IV)

ADHD was previously known as attention-deficit disorder or minimal brain dysfunction. Other terms used to describe this behavioural syndrome include: hyperkinetic disorder, minimal brain damage, minimal cerebral dysfunction, minor cerebral dysfunction and psycho-organic syndrome of patients. Ritalin is indicated as part of a comprehensive treatment programme which typically includes psychological, educational, and social measures and is aimed at stabilising patients with a behavioural syndrome characterised by moderate to severe distractibility, short attention span, hyperactivity, emotional lability, and impulsivity. The diagnosis should be made according to DSM-IV criteria or the guidelines in ICD-10. Non-localising (soft) neurological signs, learning disability, and abnormal EEG may or may not be present, and a diagnosis of central nervous system dysfunction may or may not be warranted.

Special Diagnostic Considerations for ADHD in children

The specific aetiology of this syndrome is unknown, and there is no single diagnostic test. Proper diagnosis requires medical and neuropsychological, educational, and social investigation. Characteristics commonly reported include: history of short attention span, distractibility, emotional lability, impulsivity, and moderate-to-severe hyperactivity, minor neurological signs, and abnormal EEG. Learning may or may not be impaired. The diagnosis must be based upon a complete history and evaluation of the child and not solely on the presence of one or more of these characteristics. Drug treatment is not indicated in all children with this syndrome. Stimulants are not indicated in children with symptoms secondary to environmental factors (child abuse in particular) and/or primary psychiatric disorder, including psychosis. Appropriate educational placement is essential, and psychosocial intervention is generally necessary. Where remedial measures alone prove insufficient, the decision to prescribe a stimulant must be based on rigorous assessment of the severity of the child's symptoms.

Special Diagnostic Considerations for ADHD in adults

Adults with ADHD have symptom patterns characterised by shifting activities, being bored easily, restlessness, impatience, and inattentiveness. Symptoms such as hyperactivity tend to diminish with increasing age possibly due to adaptation, neurodevelopment and self-medication. Inattentive symptoms are more prominent and have a greater impact on adults with ADHD. Diagnosis in adults should include a structured patient interview to determine current symptoms. The pre-existence of childhood ADHD is to be determined retrospectively. Diagnosis should not be made solely on the presence of one or more symptoms. The decision to use a stimulant in adults must be based on a very thorough assessment of the severity and chronicity of the symptoms and their impact on the daily life of the patient.

Narcolepsy (Ritalin 10 mg tablets only)

Symptoms include daytime sleepiness, inappropriate sleep episodes, and sudden loss of voluntary muscle tone.

4.2. Posology and method of administration

Dosage regimen

The dosage of Ritalin should be individualised according to the patient's clinical needs and responses.

In the treatment of ADHD, an attempt should be made to time administration to coincide with the periods of greatest academic, behavioural, or social stress.

Ritalin should be started at a low dose, with increments at weekly intervals. Daily doses above 60 mg are not recommended for the treatment of narcolepsy, or for the treatment of ADHD in children.

Daily doses above 80 mg are not recommended for the treatment of ADHD in adults.

If symptoms do not improve after dose titration over a period of one month, the drug should be discontinued.

If symptoms worsen or other adverse effects occur, the dosage should be reduced or, if necessary, the drug discontinued.

If the effect of the drug wears off too early in the evening, disturbed behaviour and/or inability to go to sleep may recur. A small evening dose of Ritalin may help to solve this problem.

Special populations

Renal impairment

No studies have been performed in renally impaired patients (see section 5.2 Pharmacokinetic properties).

Hepatic impairment

No studies have been performed in hepatically impaired patients (see section 5.2 Pharmacokinetic properties).

Geriatric patients

No studies have been performed in patients over 60 years of age (see section 5.2 Pharmacokinetic properties).

Pre-treatment screening

Before initiating Ritalin treatment, patients should be assessed for pre-existing cardiovascular

and psychiatric disorders and a family history of sudden death, ventricular arrhythmia and psychiatric disorders. Weight and height should also be measured before treatment and documented on a growth chart (see section 4.3 Contraindications and section 4.4 Special warnings and precautions for use).

Periodic assessment of the treatment in ADHD

Drug treatment does not need to be indefinite. Physicians should periodically re-evaluate the treatment with trial periods off medication to assess the patient's functioning without pharmacotherapy. Improvement may be sustained when the drug is either temporarily or permanently discontinued.

When used in children with ADHD, treatment can usually be discontinued during or after puberty.

Target population

ADHD

Children (6 years and over) and adolescents

Ritalin Tablets:

Start with 5 mg once or twice daily (e.g. at breakfast and lunch) with weekly increments of 5 to 10 mg. The total daily dosage should be administered in divided doses.

Ritalin LA Capsules:

Ritalin LA (methylphenidate hydrochloride modified-release capsules) is for oral administration once daily in the morning. The recommended starting dose of Ritalin LA is 20 mg. When in the judgement of the clinician a lower initial dose is appropriate, patients may begin treatment with Ritalin LA 10 mg.

A maximum daily dose of 60 mg should not be exceeded.

Adults

Ritalin LA Capsules:

Ritalin LA is administered as a single dose once daily. Ritalin LA provides comparable overall exposure (AUC) of methylphenidate compared to the same total dose of Ritalin tablets administered twice daily.

Patients new to methylphenidate:

(See 5.2 Pharmacokinetic properties) The recommended starting dose of Ritalin LA in patients who are not currently taking methylphenidate is 20 mg once daily.

Patients currently using methylphenidate:

Treatment may be continued with the same daily dose.

A maximum daily dose of 80 mg should not be exceeded.

There is no difference in dosing recommended between male and female adult patients (see 5.1 Pharmacodynamic properties).

Switching patients from Ritalin tablets to Ritalin LA capsules

The recommended dose of Ritalin LA should be equal to the total daily dose of the immediate release formulation not exceeding a total dose of 60 mg in children and 80 mg in adults. Examples involving switch from the immediate-release formulation are provided in Table 1.

Table 1 Recommended daily dose when switching patients to Ritalin LA

Previous methylphenidate dose	Recommended Ritalin LA dose
5mg methylphenidate twice daily	10 mg once daily
10 mg methylphenidate twice daily	20 mg once daily
15 mg methylphenidate twice daily	30 mg once daily
20 mg methylphenidate twice daily	40 mg once daily

For other methylphenidate regimens, clinical judgement should be used when selecting the starting dose. Ritalin LA dosage may be adjusted at weekly intervals in 10 mg increments for children or in 20 mg increments for adults.

Narcolepsy

Only the Ritalin tablets formulation is approved in the treatment of narcolepsy in adults.

Adults

Ritalin Tablets:

The average daily dose is 20 to 30 mg, given in 2 to 3 divided doses. Some patients may require 40 to 60 mg daily, while for others, 10 to 15 mg daily will be adequate. Patients who are unable to sleep if medication is taken late in the day should take the last dose before 6 p.m.

A maximum daily dose of 60 mg should not be exceeded.

Method of administration

General recommendations

Ritalin Tablets:

Ritalin 10 mg tablets can be taken with or without food (see 5.2 Pharmacokinetic properties).

Ritalin LA Capsules:

Ritalin LA capsules and/or their contents should not be crushed, chewed, or divided.

Ritalin LA capsules may be administered with or without food.

They may be swallowed whole or alternatively may be administered by sprinkling the contents over a small amount of food (see the instructions: Administration by sprinkling LA capsule contents on food).

Administration by sprinkling Ritalin LA capsule contents on food

The capsules may be carefully opened and the beads sprinkled over soft food (e.g. apple-sauce). The food should not be warm because this could affect the modified-release properties of this formulation.

The mixture of drug and food should be consumed immediately in its entirety. The drug and food mixture should not be stored for future use.

4.3. Contraindications

- Hypersensitivity to methylphenidate or to any of the excipients listed in section 6.1
- Anxiety, tension
- Agitation
- Hyperthyroidism
- Pre-existing cardiovascular disorders including severe hypertension, angina, arterial occlusive disease; heart failure, haemodynamically significant congenital heart disease, cardiomyopathies, myocardial infarction, potentially life-threatening arrhythmias and channelopathies (disorders caused by the dysfunction of ion channels)
- During treatment with monoamine oxidase (MAO) inhibitors, or within a minimum of 2 weeks of discontinuing those drugs, due to risk of hypertensive crisis (see section 4.5 Interaction with other medicinal products and other forms of interaction)
- Glaucoma
- Phaeochromocytoma
- Diagnosis or family history of Tourette's syndrome.

4.4. Special warnings and precautions for use

General

Treatment with Ritalin is not indicated in all cases of Attention-Deficit/Hyperactivity disorder, and should be considered only after detailed history-taking and evaluation. The decision to prescribe Ritalin should depend on an assessment of the severity of symptoms and in paediatric patients, the appropriateness to the child's age, and not simply on the presence of one or more abnormal behavioural characteristics. Where these symptoms are associated with acute stress reactions, treatment with Ritalin is usually not indicated.

Stimulants, including non-pharmacotherapeutics (e.g., energy drinks, caffeine) should be used with caution in patients during treatment with Ritalin (see section 4.5 Interaction with other medicines and other forms of interaction).

Drug abuse, misuse, addiction, and dependence

Chronic abuse of Ritalin can lead to marked tolerance and psychological dependence with varying degrees of abnormal behaviour. Frank psychotic episodes may occur, especially with parenteral abuse. Clinical data indicate that children given Ritalin are not more likely to abuse drugs as adolescents or adults.

Caution is called for in emotionally unstable patients, such as those with a history of drug dependence or alcoholism, because they may increase the dosage on their own initiative.

Abuse, misuse, and addiction

Before prescribing Ritalin, assess each patient’s risk for abuse, misuse, and addiction. Educate patients and their families about these risks and proper disposal of any unused drug. Advise patients to store Ritalin in a safe place, preferably locked, and instruct patients to not give Ritalin to anyone else. Throughout Ritalin treatment, reassess each patient’s risk of abuse, misuse, and addiction and frequently monitor for signs and symptoms of abuse, misuse, and addiction.

Ritalin has a high potential for abuse and misuse which can lead to the development of a substance use disorder, including addiction. Ritalin can be diverted for non-medical use into illicit channels or distribution.

Abuse is the intentional non-therapeutic use of a drug, even once, to achieve a desired psychological or physiological effect. Misuse is the intentional use, for therapeutic purposes, of a drug by an individual in a way other than prescribed by a health care provider or for whom it was not prescribed. Drug addiction is a cluster of behavioral, cognitive, and physiological phenomena that may include a strong desire to take the drug, difficulties in controlling drug use (e.g., continuing drug use despite harmful consequences, giving a higher priority to drug use than other activities and obligations), and possible tolerance or physical dependence.

Misuse and abuse of methylphenidate hydrochloride may cause increased heart rate, respiratory rate, or blood pressure; sweating; dilated pupils; hyperactivity; restlessness; insomnia; decreased appetite; loss of coordination; tremors; flushed skin; vomiting; and/or abdominal pain. Anxiety, psychosis, hostility, aggression, and suicidal or homicidal ideation have also been observed with CNS stimulants abuse and/or misuse. Misuse and abuse of CNS stimulants, including Ritalin, can result in overdose and death (see 4.9 Overdosage), and this risk is increased with higher doses or unapproved methods of administration, such as snorting or injection.

Dependence

Physical Dependence

Ritalin may produce physical dependence. Physical dependence is a state that develops as a result of physiological adaptation in response to repeated drug use, manifested by withdrawal signs and symptoms after abrupt discontinuation or a significant dose reduction of a drug.

Withdrawal signs and symptoms after abrupt discontinuation or dose reduction following prolonged use of CNS stimulants including Ritalin include dysphoric mood; depression; fatigue; vivid, unpleasant dreams; insomnia or hypersomnia; increased appetite; and psychomotor retardation or agitation.

Tolerance

Ritalin may produce tolerance. Tolerance is a physiological state characterized by a reduced response to a drug after repeated administration (i.e., a higher dose of a drug is required to produce the same effect that was once obtained at a lower dose).

Cardiovascular

Pre-existing Structural Cardiac Abnormalities or Other Serious Heart Problems:

Sudden death has been reported in association with the use of stimulants of the central nervous system at usual doses in patients with structural cardiac abnormalities or other serious problems. A causal relationship with stimulant products has not been established since some of these conditions alone may carry an increased risk of sudden death. Stimulant products generally should not be used in patients with known structural cardiac abnormalities, or other serious cardiac disorders that may increase the risk of sudden death due to sympathomimetic effects of a stimulant drug.

Before initiating Ritalin treatment, patients should be assessed for pre-existing cardiovascular disorders and a family history of sudden death and ventricular arrhythmia (see 4.2 Posology and method of administration).

Cardiovascular Conditions:

Ritalin is contraindicated in patients with severe hypertension (see section 4.3 Contraindications). Ritalin increases heart rate and systolic and diastolic blood pressure. Therefore, caution is indicated in treating patients whose underlying medical conditions might be compromised by increases in blood pressure or heart rate, e.g., those with pre-existing hypertension. Severe cardiovascular disorders are contraindicated (see section 4.3 Contraindications).

Blood pressure should be monitored at appropriate intervals in all patients taking Ritalin, especially those with hypertension. Patients who develop symptoms suggestive of cardiac disease during Ritalin treatment should undergo a prompt cardiac evaluation.

Misuse and Cardiovascular Events:

Misuse of stimulants of the central nervous system, including Ritalin, may be associated with sudden death and other serious cardiovascular adverse events.

Cerebrovascular

Cerebrovascular conditions:

Patients with pre-existing central nervous system (CNS) abnormalities, e.g., cerebral aneurysm and/or other vascular abnormalities such as vasculitis or pre-existing stroke should not be treated with Ritalin. Patients with additional risk factors (history of cardiovascular disease, concomitant medications that elevate blood pressure) should be assessed regularly for neurological/psychiatric signs and symptoms after initiating treatment with Ritalin (see above, paragraph on Cardiovascular Conditions and section 4.5 Interaction with other medicinal products and other forms of interaction).

Psychiatric

Co-morbidity of psychiatric disorders in ADHD is common and should be taken into account when prescribing stimulant products. Prior to initiating treatment with Ritalin, patients should be assessed for pre-existing psychiatric disorders and a family history of psychiatric disorders (see section 4.2 Posology and method of administration).

Treatment of ADHD with stimulant products including Ritalin should not be initiated in patients with acute psychosis, acute mania or acute suicidality. These acute conditions should be treated and controlled before ADHD treatment is considered.

In the case of emergent psychiatric symptoms or exacerbation of pre-existing psychiatric symptoms, Ritalin should not be given to patients unless the benefit outweighs the potential risk.

Exacerbation of Pre-existing Psychosis

CNS stimulants may exacerbate symptoms of behavior disturbance and thought disorder in patients with a preexisting psychotic disorder.

Induction of a Manic Episode in Patients with Bipolar Disorder

CNS stimulants may induce a manic or mixed mood episode in patients. Prior to initiating Ritalin treatment, screen patients for risk factors for developing a manic episode (e.g., comorbid or history of depressive symptoms or a family history of suicide, bipolar disorder, or depression).

New Psychotic or Manic Symptoms

CNS stimulants, at the recommended dosage, may cause psychotic or manic symptoms (e. g., hallucinations, delusional thinking, or mania) in patients without a prior history of psychotic illness or mania.

In a pooled analysis of multiple short-term, placebo-controlled studies of CNS stimulants, psychotic or manic symptoms occurred in approximately 0.1% of CNS stimulant-treated patients, compared to 0% of placebo-treated patients.

If such symptoms occur, consider discontinuing treatment.

Aggressive behaviour:

Emergent aggressive behaviour or an exacerbation of baseline aggressive behaviour has been reported during stimulant therapy, including Ritalin. Physicians should evaluate the need for adjustment of treatment regimen in patients experiencing these behavioural changes, bearing in mind that upwards or downwards titration may be appropriate. Treatment interruption can be considered.

Suicidal tendency:

Patients and caregivers of patients should be alerted about the need to monitor for clinical worsening, suicidal behaviour or thoughts or unusual changes in behaviour and to seek medical advice immediately if these symptoms appear. The physician should initiate appropriate treatment of any underlying psychiatric condition and consider a possible discontinuation or change in the ADHD treatment.

Tics:

Ritalin is associated with the onset or exacerbation of motor and verbal tics. Worsening of Tourette's syndrome has also been reported (see section 4.8 Undesirable effects). Family history should be assessed and clinical evaluation for tics or Tourette's syndrome in patients should precede use of methylphenidate for ADHD treatment. Ritalin is contraindicated in case of diagnosis or family history of Tourette's syndrome (see section 4.3 Contraindications). Patients should be regularly monitored for the emergence or worsening of tics during treatment with Ritalin.

Serotonin syndrome:

Serotonin syndrome has been reported following co-administration of methylphenidate with serotonergic drugs such as selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs). The concomitant use of methylphenidate and serotonergic drugs is not recommended as this may lead to the development of serotonin syndrome. The symptoms of serotonin syndrome may include mental status changes (e.g. agitation, hallucinations, delirium, and coma), autonomic instability (e.g. tachycardia, labile blood pressure, dizziness, diaphoresis, flushing, hyperthermia), neuromuscular symptoms (e.g. tremor, rigidity, myoclonus, hyperreflexia, incoordination), seizures, and/or gastrointestinal symptoms (e.g. nausea, vomiting, diarrhoea). Prompt recognition of these symptoms is important so that treatment with methylphenidate and serotonergic drugs can be immediately discontinued and appropriate treatment instituted (see section 4.5 Interaction with other medicinal products and other forms of interaction).

Acute Angle Closure Glaucoma

There have been reports of acute angle closure glaucoma associated with methylphenidate treatment. Although the mechanism is not clear, Ritalin-treated patients considered at risk for acute angle closure glaucoma (e.g., patients with significant hyperopia) should be evaluated by an ophthalmologist.

Increased Intraocular Pressure and Glaucoma

There have been reports of an elevation of intraocular pressure (IOP) and glaucoma (including open angle glaucoma and angle closure glaucoma) associated with methylphenidate treatment (see section 4.8 Undesirable effects). Close monitoring of Ritalin-treated patients with a history of abnormally increased IOP or glaucoma is recommended.

Priapism

Prolonged and painful erections, sometimes requiring surgical intervention, have been reported with methylphenidate products in both pediatric and adult patients. Priapism generally developed after some time on the drug, often subsequent to an increase in dose. Priapism has also been reported during a period of drug withdrawal (drug holidays or during discontinuation). Patients who develop abnormally sustained or frequent and painful erections should seek immediate medical attention.

Growth retardation

Moderately reduced weight gain and slight growth retardation have been reported with the long-term use of stimulants, including Ritalin, in children (see section 4.8 Undesirable effects).

Growth should be monitored as clinically necessary during treatment with Ritalin, and patients who are not growing or gaining height or weight as expected may need to have their treatment interrupted.

Seizures

Ritalin should be used with caution in patients with epilepsy as clinical experience has shown that it can cause an increase in seizure frequency in a small number of such patients. If seizure frequency increases, Ritalin should be discontinued.

Withdrawal

Careful supervision is required during drug withdrawal, since this may unmask depression as well as the effects of chronic over activity. Some patients may require long-term follow-up.

Haematological effects

The long-term safety and efficacy profiles of Ritalin are not fully known. Patients requiring long-term therapy should therefore be carefully monitored and complete and differential blood counts and a platelet count performed periodically. In the event of haematological disorders appropriate medical intervention should be considered (see section 4.8 Undesirable effects).

Paediatric patients (under 6 years of age)

Ritalin should **not** be used in children under 6 years of age, since safety and efficacy in this age group have not been established.

Non-clinical safety data

In a conventional study conducted in young rats, methylphenidate was administered orally at doses of up to 100 mg/kg/day for 9 weeks, starting early in the postnatal period (postnatal day 7) and continuing through sexual maturity (postnatal week 10). When the animals were tested as adults (postnatal weeks 13-14), decreased spontaneous locomotor activity was observed in males and females previously treated with 50 mg/kg/day or greater, and a deficit in the acquisition of a specific learning task was seen in females exposed to the highest dose of 100 mg/kg/day (about 58-fold higher than the MRHD on a mg/kg basis).

Genotoxicity

With methylphenidate, sister chromatid exchange and chromosome aberrations were elevated in one *in vitro* study in Chinese Hamster Ovary (CHO) cells. However, no genotoxicity effects were seen in several other assays, including no mutagenic effects in three *in vitro* tests (Ames reverse mutation test, mouse lymphoma forward mutation test, human lymphocyte

chromosome aberration test) and no evidence of clastogenic or aneugenic effects in two *in vivo* mouse bone marrow (micronucleus tests, at doses up to 250 mg/kg. B6C3F1 mice from the same strain that showed liver tumours in the cancer bioassay were used in one of these studies. Additionally, there was no genotoxic potential as assessed by measuring cII mutations in the liver and micronuclei in peripheral reticulocytes in the Big Blue mouse, micronuclei in peripheral blood reticulocytes, HPRT mutations and chromosomal aberrations in peripheral blood lymphocytes of rhesus monkeys. Pig A locus mutations in adolescent rats, micronucleated reticulocyte frequencies in blood and DNA damage in blood, brain, and liver cells of adult male rats treated for 28 consecutive days, and by measuring micronuclei in mouse peripheral blood erythrocytes.

Carcinogenicity

In a lifetime carcinogenicity study carried out in B6C3F1 mice, methylphenidate caused an increase in hepatocellular adenomas (a benign tumour) and, in males only, an increase in hepatoblastomas (a malignant tumour) at daily doses of approximately 60 mg/kg/day (about 35-fold-higher than the MRHD on a mg/kg basis). Hepatoblastoma is a relatively rare rodent malignant tumor type. There was no overall increase in the number of malignant hepatic tumours. The mouse strain used is particularly sensitive to the development of hepatic tumours. It is thought that hepatoblastomas might be due to non-genotoxic mechanisms such as an increase in hepatic cell proliferation. This is consistent with the increase in liver weights observed in this mouse carcinogenicity study.

Methylphenidate did not cause any increase in tumors in a lifetime carcinogenicity study carried out in F344 rats; the highest dose used was approximately 45 mg/kg/day (about 26-fold higher than the MRHD on a mg/kg basis).

Excipients with known effect

Ritalin 10 mg tablets

Lactose:
Patients with the rare hereditary problems of galactose intolerance, total lactase deficiency or glucose-galactose malabsorption should not use this medicinal product.

Wheat starch:
One 10 mg Ritalin tablet contains no more than 4.8 micrograms gluten.

Ritalin LA modified-release capsules

Sugar spheres:

Patients with the rare hereditary problems of fructose/galactose intolerance, glucose-galactose malabsorption or sucrase-isomaltase insufficiency should not use this medicinal product.

4.5. Interaction with other medicinal products and other forms of interaction

Pharmacodynamic interactions

Anti-hypertensive drugs

Ritalin may decrease the effectiveness of drugs used to treat hypertension.

Use with drugs that elevate blood pressure

Ritalin should be used with caution in patients being treated with drugs that elevate blood pressure (see also paragraph on Cerebrovascular Conditions in section 4.4 Special warnings and precautions for use).

Because of possible hypertensive crisis, Ritalin is contraindicated in patients being treated (currently or within the preceding 2 weeks) with MAO-inhibitors (see section 4.3 Contraindications).

Use with alcohol

Alcohol may exacerbate the adverse CNS effects of psychoactive drugs, including Ritalin. It is therefore advisable for patients to abstain from alcohol during treatment.

Use with anaesthetics

There is a risk of sudden blood pressure and heart rate increase during surgery. If surgery is planned, Ritalin should not be taken on the day of surgery.

Use with centrally acting alpha-2 agonists (e.g. clonidine)

Serious adverse events including sudden death have been reported in concomitant use with clonidine, although no causality for the combination has been established.

Use with dopaminergic drugs

As an inhibitor of dopamine reuptake, Ritalin may be associated with pharmacodynamic interactions when co-administered with direct and indirect dopamine agonists (including DOPA and tricyclic antidepressants) as well as dopamine antagonists (antipsychotics, e.g. haloperidol).

Concomitant use of Ritalin with antipsychotics is not recommended due to its counteracting mechanism of action. If upon medical assessment the combination is deemed necessary, monitoring for extrapyramidal symptoms (EPS) is recommended, as the concomitant use of methylphenidate with antipsychotics may increase the risk of EPS when there is a change (increase or decrease) in dosage of either or both medications.

Use with stimulants

Stimulants, including non-pharmacotherapeutics (e.g., energy drinks, caffeine) should be used with caution in patients during treatment with Ritalin (see Section 4.4 Special warnings and precautions for use).

Use with serotonergic drugs

The concomitant use of methylphenidate and serotonergic drugs is not recommended as this may lead to the development of serotonin syndrome (see section 4.4 Special warnings and precautions for use). Methylphenidate has been shown to increase extracellular serotonin and norepinephrine and appears to have weak potency in binding serotonin transporter.

Pharmacokinetic interactions

Ritalin is not metabolized by cytochrome P450 to a clinically relevant extent. Inducers or inhibitors of cytochrome P450 are not expected to have any relevant impact on Ritalin pharmacokinetics. Conversely, the d- and l-enantiomers of methylphenidate in Ritalin did not relevantly inhibit cytochrome P450 1A2, 2C8, 2C9, 2C19, 2D6, 2E1 or 3A.

Ritalin co-administration did not increase plasma concentrations of the CYP2D6 substrate desipramine.

Case reports suggested a potential interaction of Ritalin with coumarin anticoagulants, some anticonvulsants (e.g. phenobarbital, phenytoin, primidone), phenylbutazone, and tricyclic antidepressants but pharmacokinetic interactions were not confirmed when explored at larger sample sizes. The dosage of these drugs might have to be reduced.

An interaction with the anticoagulant ethyl biscoumacetate in 4 subjects was not confirmed in a subsequent study with a larger sample size (n=12).

Other specific drug-drug interaction studies with Ritalin have not been performed *in vivo*.

Drug/Laboratory test

Methylphenidate may induce false positive laboratory tests for amphetamines, particularly with immunoassays screen test.

4.6. Fertility, pregnancy and lactation

Women of child-bearing potential

There are no data to support special recommendation in women of child-bearing potential.

Pregnancy

There is insufficient experience with use of methylphenidate in pregnant women. Ritalin should not be given to pregnant women unless the potential benefit outweighs the risk to the foetus. Methylphenidate is potentially teratogenic in rabbits (see Non-clinical safety data below).

Non-clinical safety data

Reproductive toxicity

Methylphenidate is considered to be possibly teratogenic in rabbits. Spina bifida with malrotated hind limbs was observed in two separate litters at a dose of 200 mg/kg/day. Exposure (AUC) at this dose was approximately 5.1 times higher than the extrapolated exposure at the maximum recommended human dose (MRHD). Exposure at the next lower dose, wherein no spina bifida was found, was 0.7 times the extrapolated exposure at MRHD. A second study was conducted with a high dose of 300 mg/kg, which was considered maternally toxic. No spina bifida was seen, however, in 12 litters (92 foetuses) surviving. Exposure (AUC) at 300 mg/kg was 7.5 times the extrapolated exposure at MRHD.

Methylphenidate is not teratogenic in rats. Development foetal toxicity was noted at a high dose of 75 mg/kg (20.9 times higher than the AUC at MRHD) and consisted of an increase of the instance of foetuses with delayed ossification of the skull and hyoid bones as well as foetuses with short supernumerary ribs.

When methylphenidate was administered to rats throughout pregnancy and lactation at doses of up to 45 mg/kg/day (about 26-fold higher than the MRHD on a mg/kg basis), offspring body weight gain was decreased at the highest dose, but no other effects on postnatal development were observed.

Lactation

Case reports showed that methylphenidate was distributed into breast milk reaching a milk-to-plasma ratio of approximately 2.5 (see section 5.2 Pharmacokinetic properties).

A decision should be made whether to abstain from breast-feeding or to abstain from methylphenidate therapy, taking into account the benefit of breast-feeding to the child and the benefit of therapy to the mother.

It is not known whether the active substance of Ritalin and/or its metabolites pass into breast milk, but for safety reasons, breast-feeding mothers should not use Ritalin.

Non-clinical safety data

When methylphenidate was administered to rats throughout pregnancy and lactation at doses of up to 45 mg/kg/day (about 26-fold higher than the MRHD on a mg/kg basis), offspring body weight gain was decreased at the highest dose, but no other effects on postnatal development were observed.

Fertility

No human data on the effect of methylphenidate on fertility are available. Methylphenidate did not impair fertility in male or female mice (see Non-clinical safety data below).

Non-clinical safety data

Methylphenidate did not impair fertility in male or female mice that were fed diets containing the drug in an 18-week continuous breeding study. The study was conducted over two generations of mice continuously receiving methylphenidate doses of up to 160 mg/kg/day (about 90-fold higher than the MRHD on a mg/kg basis).

4.7. Effects on ability to drive and use machines

Ritalin may cause dizziness, drowsiness, blurred vision, hallucinations or other CNS side effects (see section 4.8 Undesirable effects).

Patients experiencing such side effects should refrain from driving, operating machinery or engaging in other potentially hazardous activities.

4.8. Undesirable effects

Nervousness and insomnia are very common adverse reactions which occur at the beginning of Ritalin treatment but can usually be controlled by reducing the dosage and/or omitting the afternoon or evening dose.

Decreased appetite is also very common but usually transient. Abdominal pain, nausea and vomiting are common to very common, usually occur at the beginning of treatment and may be alleviated by concomitant food intake.

Tabulated summary of adverse drug reactions

The adverse reactions listed in Table 2 are listed by MedDRA (v15.1) system organ class. Within each organ class, the adverse drug reactions are ranked by frequency, using the following convention: very common ≥ 10%, common ≥ 1% to < 10%; uncommon ≥ 0.1% to < 1%; rare ≥ 0.01% to < 0.1%; very rare < 0.01%.

Table 2 Adverse reactions reported with Ritalin use from clinical studies, spontaneous reports and literature

Infections and infestations	
Very common:	Nasopharyngitis*
Blood and the lymphatic system disorders	
Very rare:	Leucopenia, thrombocytopenia, anaemia
Immune system disorders	
Very rare:	Hypersensitivity reactions, including angioedema*** and anaphylaxis
Metabolism and nutrition disorders	
Very common:	Decreased appetite**

Rare:	Moderately reduced weight gain during prolonged use in children
Psychiatric disorders	
Very common:	Nervousness, insomnia
Common:	Anxiety*, restlessness*, sleep disorder*, agitation*, depression, aggression, bruxism
Very rare:	Hyperactivity, psychosis (sometimes with visual and tactile hallucinations), transient depressed mood
Nervous system disorders	
Common:	Dyskinesia, tremor*, headache, drowsiness, dizziness
Very rare:	Convulsions, choreoathetoid movements, tics or exacerbation of existing tics and Tourette's syndrome, cerebrovascular disorders including vasculitis, cerebral haemorrhages and cerebrovascular accidents
Eye disorders	
Rare:	Difficulties in visual accommodation, blurred vision
Cardiac disorders	
Common:	Tachycardia, palpitation, arrhythmias, changes in blood pressure and heart rate (usually an increase)
Rare:	Angina pectoris
Respiratory, Thoracic and mediastinal disorders	
Common:	Cough*
Gastrointestinal disorders	
Very common:	Nausea**, dry mouth**
Common:	Abdominal pain, vomiting, dyspepsia*, toothache*
Hepatobiliary disorders	
Very rare:	Abnormal liver function, ranging from transaminase elevation to hepatic coma
Skin and subcutaneous tissue disorders	
Common:	Rash, pruritus, urticaria, fever, scalp hair loss, hyperhidrosis*
Very rare:	Thrombocytopenic purpura, exfoliative dermatitis, erythema multiforme
Musculoskeletal and connective tissue disorders	
Common:	Arthralgia
Uncommon:	Trismus
Very rare:	Muscle cramps
General disorders and administration site conditions	
Common:	Feeling jittery*
Rare:	Slight growth retardation during prolonged use in children

Investigations	
Common:	Weight decreased*
Vascular disorders	
Common:	Raynaud's phenomenon**, peripheral coldness**

* ADRs reported from the clinical trials performed in adult ADHD patients (hyperhidrosis in paediatric patients was reported in post-marketing reports).

** The reported frequency of ADRs was based on the frequency observed higher in the adult ADHD clinical study which was higher than that previously reported for children.

*** includes angioneurotic oedema

Very rare reports of poorly documented neuroleptic malignant syndrome (NMS) have been received. In most of these reports, patients were also receiving other medications. It is uncertain what role Ritalin played in these cases.

Adverse drug reactions from spontaneous reports and literature cases (frequency not known)

The following adverse drug reactions have been derived from post-marketing experience with Ritalin via spontaneous case reports and literature cases. Because these reactions are reported voluntarily from a population of uncertain size, it is not possible to reliably estimate their frequency which is therefore categorized as not known. Adverse drug reactions are listed according to system organ classes in MedDRA. Within each system organ class, ADRs are presented in order of decreasing seriousness.

Table 3 Adverse drug reactions from spontaneous reports and literature (frequency not known)

Blood and lymphatic disorders
Pancytopenia
Psychiatric disorders
Dysphemia, suicidal ideation or attempt (including completed suicide), irritability, affect lability, abnormal behaviour or thinking abnormal, anger, mood altered, mood swings, hypervigilance, mania, disorientation, libido disorder[1], apathy, stereotypy[2], change in sustained attention[3], confusional state, drug abuse[4] and drug dependence[4]
Nervous system disorders
Reversible ischemic neurological deficit, migraine
Eye disorders
Diplopia, mydriasis, visual impairment[5]
Ear and labyrinth disorders
Auricular swelling[6]
Cardiac disorders
Cardiac arrest, myocardial infarction
Respiratory, thoracic and mediastinal disorders
Laryngeal pain[7], dyspnoea
Gastrointestinal disorders
Diarrhoea, constipation
Skin and subcutaneous tissue disorders
Erythema, fixed eruption[8]

Musculoskeletal, connective tissue and bone disorders Myalgia, muscle twitching
Renal and urinary disorders Enuresis
Reproductive system and breast disorders Priapism, erectile dysfunction, gynaecomastia
General disorders and administration site conditions Chest pain, fatigue
Investigations Increased intraocular pressure

[1] Includes libido decreased.
[2] Includes repetitive behaviours.
[3] Includes overfocusing and hyperfocusing.
[4] Cases of abuse and dependence have been described, more often with immediate-release formulations.
[5] Includes visual disturbance.
[6] Related to hypersensitivity reactions.
[7] Includes pharyngolaryngeal pain.
[8] Includes fixed drug eruption.

Table 4 Additional adverse reactions reported with other methylphenidate-containing products

The list below shows adverse reactions not listed for Ritalin (see Table 2) that have been reported with other methylphenidate-containing products based on clinical studies data and post-market spontaneous reports.

Renal and urinary disorders	Haematuria
General disorders and administration site conditions	Sudden cardiac death
Investigations	Cardiac murmur

Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product.

Any suspected adverse events should be reported to the Ministry of Health according to the National Regulation by using an online form: https://reportsideffect.health.gov.il/drugs/home.

4.9. Overdose

Signs and symptoms

Signs and symptoms of acute overdosage, mainly due to overstimulation of the central and sympathetic nervous systems, may include: vomiting, agitation, tremor, hyperreflexia, muscle twitching, convulsions (possibly followed by coma), euphoria, confusion, hallucinations, delirium, sweating, flushing, headache, hyperpyrexia, tachycardia, palpitation, cardiac arrhythmias, hypertension, mydriasis, dryness of mucous membranes and rhabdomyolysis.

Management

When treating an overdose, practitioners should bear in mind that a second release of methylphenidate from Ritalin LA (methylphenidate hydrochloride modified-release capsules) occurs approximately four hours after administration.

Management consists in providing supportive measures, and symptomatic treatment of life-threatening events, e.g. hypertensive crisis, cardiac arrhythmias, convulsions. For the most current guidance for treatment of symptoms of overdose, the practitioner should consult a certified Poison Control Centre or current toxicological publication.

Supportive measures include preventing self-injury and protecting the patient from external stimuli that would exacerbate the overstimulation already present.

The efficacy of peritoneal dialysis or extracorporeal haemodialysis for Ritalin overdosage has not been established. Clinical experience with acute overdosage is limited. Patients who have received doses higher than those recommended should be carefully monitored. In the event of overdose leading to clinically significant hypocalcaemia, reversal may be achieved with supplemental oral calcium and/or an infusion of calcium gluconate.

5. Pharmacological properties

Pharmacotherapeutic group: psychostimulants, agents used for ADHD, centrally acting sympathomimetics

ATC code: N06BA04

5.1. Pharmacodynamic properties

Ritalin is a racemate consisting of a 1:1 mixture of d-methylphenidate (d-MPH) and l-methylphenidate (l-MPH).

Ritalin is a mild CNS stimulant with more prominent effects on mental than on motor activities. Its mode of action in humans is not completely understood, but its stimulant effects are thought to be due to an inhibition of dopamine and norepinephrine reuptake into presynaptic neurons and thereby increasing these neurotransmitters in the extraneuronal space.

The mechanism by which Ritalin exerts its mental and behavioural effects in children is not clearly established, nor is there conclusive evidence showing how these effects relate to the condition of the central nervous system.

The l-enantiomer is thought to be pharmacologically inactive.

The effect of treatment with 40 mg dexmethylphenidate hydrochloride, the pharmacologically active d-enantiomer of Ritalin, on QT/QTc interval was evaluated in a study in 75 healthy volunteers. The maximum mean prolongation of QTcF intervals was <5 ms, and the upper limit of the 90% confidence interval was below 10 ms for all time matched comparisons versus placebo. This was below the threshold of clinical concern and no exposure response relationship was evident.

Clinical efficacy and safety

Ritalin has been used for over 50 years in the treatment of ADHD. Its effectiveness in the treatment of ADHD is well established. In addition to improving core symptoms of ADHD, methylphenidate also improves behaviours associated with ADHD such as impaired academic performance and social function.

Studies in the published literature have shown Ritalin to significantly improve daytime sleepiness and cataplexy.

Children with ADHD

Ritalin LA was evaluated in a randomized, double-blind, placebo-controlled, parallel group clinical study in which 134 children, ages 6 to 12, with DSM-IV diagnoses of Attention Deficit Hyperactivity Disorder (ADHD) received a single morning dose of Ritalin LA in the range of 10-40 mg/day, or placebo, for up to 2 weeks. The optimal dose for each patient was determined in a dose titration phase of the study prior to randomization.

The primary efficacy variable was the change from baseline to the final rating in the ADHD/DSM-IV Scale for Teachers (CADS-T) total subscale score. The CADS-T assesses symptoms of hyperactivity and inattention. The analysis of the primary efficacy variable showed a significant treatment difference in favour of Ritalin LA ($p < 0.0001$). A statistically significant treatment effect for Ritalin LA relative to placebo was also found in all analyses of the secondary CADS efficacy variables, as well as in two post-hoc analyses for the ADHD diagnostic subtypes (combined type, inattentive type). The results of the primary and secondary efficacy analyses are summarized in Table 5.

Table 5 ADHD/DSM-IV Subscales for teachers and parents, change from baseline (ITT population, LOCF analysis)

	Ritalin LA		**Placebo**		**p-value**
	n	Mean change[1] (SD[2])	n	Mean change[1] (SD[2])	
CADS-T subscale					
Total	62[3]	10.7 (15.7)	70[3]	-2.8 (10.6)	< 0.0001
Inattentive	62	5.3 (8.25)	70	-1.5 (5.67)	< 0.0001
Hyperactive-Impulsive	62	5.4 (7.95)	70	-1.3 (5.93)	< 0.0001
CADS-P subscale					
Total	63	6.3 (13.5)	70	0.5 (13.55)	0.0043
Inattentive	63	2.8 (7.28)	70	0.2 (6.4)	0.0213
Hyperactive-Impulsive	63	3.5 (6.87)	70	0.3 (7.66)	0.0015

[1]score at end of placebo-washout period minus final score

[2]standard deviation

[3]two patients (one in each treatment group) had no CADS-T baseline values but had post-randomization values. They are, therefore, not included in the descriptive statistics.

Adults with ADHD

Ritalin LA was evaluated in a randomized, double-blind, placebo-controlled, multicentre study (RIT124D2302) in the treatment of 725 adult patients (395 male and 330 female) diagnosed with ADHD according to DSM-IV ADHD criteria. The study was designed to:

1) Confirm the clinically effective and safe dose range of Ritalin LA for adults (18 to 60 years old) in a 9-week, double-blind, randomized, placebo-controlled, parallel group period (Period 1) consisting of a 3-week titration stage followed by a 6-week fixed dose stage (40, 60, 80 mg/day or placebo). Subsequently patients were re-titrated to their optimal dose of Ritalin LA (40, 60 or 80 mg/day) over a 5 week period (Period 2).
2) Evaluate the maintenance of effect of Ritalin LA in adults with ADHD in a 6 month, double-blind, randomized, withdrawal study (period 3).

Efficacy was assessed using the DSM-IV ADHD rating scale (DSM-IV ADHD RS) for symptomatic control and Sheehan Disability Score (SDS) for functional improvement as change in respective total scores from baseline to the end of the first period. All dose levels of Ritalin LA showed significantly greater symptom control ($p < 0.0001$ for all dose levels) compared to placebo as measured by a reduction in DSM-IV ADHD RS total score. All doses of Ritalin LA showed significantly greater functional improvement ($p=0.0003$ at 40 mg,

p=0.0176 at 60 mg, p < 0.0001 at 80 mg) compared to placebo as measured by reduction in SDS total score (see Table 6).

Significant clinical efficacy was demonstrated in all three Ritalin LA dose levels using physician rated scales [Clinical Global Impression- Improvement (CGI-I) and Clinical Global Improvement- Severity (CGI-S)], self-rated scales [Adult Self-Rating Scale (ASRS)] and observer- rated scales [Conners' Adult ADHD Rating Scale Observer Short Version (CAARS O: S)]. The results were consistently in favour of Ritalin LA over placebo across all assessments in period 1.

Table 6 Analysis of improvement from baseline 1 to end of Period 1 in DSM IV ADHD RS total score and SDS total score by treatment / (LOCF*) for Period 1

		Ritalin LA 40 mg	Ritalin LA 60 mg	Ritalin LA 80 mg	Placebo
Change in DSM-IV ADHD RS from baseline	n	160	155	156	161
	LS mean**	15.45	14.71	16.36	9.35
	p-value	<0.0001	<0.0001	<0.0001	
	Significance level	0.0167	0.0208	0.0313	
Change in SDS total score from baseline	n	151	146	148	152
	LS mean	5.89	4.9	6.47	3.03
	p-value	0.0003	0.0176	<0.0001	
	Significance level***	0.0167	0.0208	0.0313	

* LOCF: Last Observation Carried Forward using the final visit for each patient with data in the 6-week fixed-dose phase of Period 1

**LS mean: Least Square mean changes from Analysis of Covariance (ANCOVA) model with treatment group & centre as factors and baseline DSM-IV ADHD RS total score and SDS total score as covariate

***Significance level: the final two-sided level of significance (alpha) for the test following the extended gatekeeping procedure

Maintenance of effect of Ritalin LA was evaluated by measuring the percentage of treatment failure in Ritalin LA compared to the placebo group at the end of a 6-month maintenance period (see Table 7). Once the Ritalin LA dose was optimized in Period 2, approximately 79 % of patients continued to maintain disease control for a period of at least 6 months (p < 0.0001 vs. placebo). An odds ratio of 0.3 suggested that patients treated with placebo had a 3 times higher chance of becoming a treatment failure compared to Ritalin LA.

Table 7 Percentage of treatment failures during Period 3

			All Ritalin LA vs placebo	
	All Ritalin LA N=352 n (%)	Placebo N=115 n (%)	Odds ratio (95% CI)	P-value* (significance level**)
Treatment failure	75 (21.3)	57 (49.6)	0.3 (0.2, 0.4)	<0.0001 (0.0500)
Not treatment failure	277 (78.7)	58 (50.4)		

* Two-sided p-value based on comparison between each Ritalin LA group and placebo using the logistic regression model.

**Significance level = the final two-sided level of significance (alpha) for the test following the extended gatekeeping procedure

Patients who entered Period 3 had completed a total of between 5-14 weeks of Ritalin LA treatment in Periods 1 and 2. Patients then assigned to placebo in Period 3 did not experience increased signs of withdrawal and rebound compared to patients who continued on Ritalin LA treatment.

The study performed in adults did not suggest any difference in efficacy or safety amongst gender subgroups (see section 4.2 Posology and method of administration).

The long term efficacy and safety of Ritalin LA in adult patients was further evaluated in a 26-week open label extension study of Ritalin LA in 298 adult patients with ADHD (RIT124D2302E1). Combining all patients in both studies, a total of 354 patients continuously received Ritalin LA for > 6 months and 136 patients for > 12 months.

The safety profile of Ritalin LA did not change with the longer duration of treatment of adult ADHD patients. The safety profile seen in study RIT124D2302E1 was similar to that observed in study RIT124D2302. No unexpected serious adverse events or adverse events were observed in this extension study and the commonly observed adverse events were expected and driven by the pharmacologic activity.

Furthermore, Ritalin LA treatment during the study consistently demonstrated clinical efficacy when using self-rated scales (SDS) and physician-rated scales (ie, DSM-IV ADHD RS, CGI-I, and CGI-S). The results were consistently in favor of Ritalin LA treatment across all assessments. Patients continued to show symptomatic improvement and a reduction in functional impairment throughout the study as shown by the mean change in DSM-IV ADHD total score by -7.2 points and the mean change in SDS total score by 4.8 points when assessed against the extension baseline.

5.2. Pharmacokinetic properties

Absorption

Tablets

After oral administration the active substance (methylphenidate hydrochloride) is rapidly and almost completely absorbed. Owing to extensive first-pass metabolism, the absolute bioavailability was 22±8 % for the d-enantiomer and 5±3 % for the l-enantiomer. Ingestion with food has no relevant effect on the rate of absorption. Peak plasma concentrations of about 40 nmol/L (11 ng/mL) are reached on average 1 to 2 hours after administration. Peak plasma concentrations vary markedly between patients. The area under the concentration-time curve (AUC), and the peak plasma concentration (C_{max}) are proportional to the dose.

LA Capsules

Following oral administration of Ritalin LA (modified-release capsules) to children diagnosed with ADHD and adults, methylphenidate is rapidly absorbed and produces a bi-modal plasma concentration-time profile (i.e. two distinct peaks approximately four hours apart). The relative bioavailability of Ritalin LA given once daily is comparable to the same total dose of Ritalin or methylphenidate tablets given twice a day in children and in adults.

The fluctuations between peak and trough plasma methylphenidate concentrations are smaller for Ritalin LA given once a day compared to Ritalin tablets given twice a day.

Food Effects

Ritalin LA may be administered with or without food. There were no differences in the bioavailability of Ritalin LA when administered with either a high-fat breakfast or applesauce, compared to administration in the fasting condition. There is no evidence of dose dumping in the presence or absence of food.

For patients unable to swallow the capsule, the contents may be sprinkled on soft food such as apple-sauce and administered (see section 4.2 Posology and method of administration).

Distribution

In blood, methylphenidate and its metabolites are distributed between plasma (57 %) and erythrocytes (43 %). Binding to plasma proteins is low (10 to 33 %). The volume of distribution was 2.65±1.11 L/kg for d-MPH and 1.80±0.91 L/kg for l-MPH.

Methylphenidate excretion into breast milk has been noted in two case reports, where the calculated relative infant dose was ≤ 0.2 % of the weight adjusted maternal dose. Adverse events were not noted in either infant (6 and 11 months of age).

Biotransformation

Biotransformation of methylphenidate by the carboxylesterase CES1A1 is rapid and extensive. Peak plasma concentrations of the main, deesterified, metabolite - alpha-phenyl-2-piperidine acetic-acid (ritalinic acid) - are attained about 2 hours after administration and are 30 to 50 times higher than those of the unchanged substance. The elimination half-life of alpha-phenyl-2-piperidine acetic acid is about twice that of methylphenidate, and its mean systemic clearance is 0.17 L/h/kg. Only small amounts of hydroxylated metabolites (e.g. hydroxymethylphenidate and hydroxyritalinic acid) are detectable. Therapeutic activity seems to be principally due to the parent compound.

Elimination

Methylphenidate is eliminated from the plasma with a mean elimination half-life of 2 hours. The systemic clearance is 0.40±0.12 L/h/kg for d-MPH and 0.73±0.28 L/h/kg for l-MPH. After oral administration, 78 to 97 % of the dose is excreted in urine and 1 to 3 % in the faeces in the form of metabolites within 48 to 96 hours. Only small quantities (< 1 %) of unchanged methylphenidate appear in the urine. Most of the dose is excreted in urine as alpha-phenyl-2-piperidine acetic acid (60 to 86 %).

Special Populations

Effects of Age

There are no apparent differences in the pharmacokinetics of methylphenidate between hyperactive children (6-13 years) and healthy adult volunteers.

Patients with renal impairment

Elimination data from patients with normal renal function suggest that renal excretion of unchanged methylphenidate would hardly be diminished in the presence of impaired renal function. However, renal excretion of the metabolite alpha-phenyl-2-piperidine acetic acid may be reduced.

6. Pharmaceutical particulars

6.1. List of excipients

Tablet 10 mg: wheat starch, lactose cryst., calcium phosphate tribasic, talc, gelatine and magnesium stearate.

LA Capsule 10 mg, 20 mg, 30 mg and 40 mg: sugar spheres, ammonio methacrylate copolymer type B, methacrylic acid copolymer type A, talc, triethyl citrate, polyethylene glycol 6000, gelatin, titanium dioxide, iron oxide yellow (10, 30 and 40 mg capsules only), iron oxide black (10 mg and 40 mg capsules only), iron oxide red (10 mg and 40 mg capsules only) and tan-coloured printing ink.

6.2. Incompatibilities

Not applicable.

6.3. Shelf-life

The expiry date of the product is indicated on the packaging materials.

6.4. Special precautions for storage

Ritalin tablet 10 mg

Do not store above 25°C.

Store in the original package in order to protect from moisture.

Ritalin should be kept out of the reach and sight of children.

Ritalin LA capsules 10mg, 20 mg, 30 mg and 40mg

Store below 30°C.

Keep the bottle tightly closed in order to protect from moisture.

After first opening of the bottle use within 6 months.

Ritalin should be kept out of the reach and sight of children.

6.5. Nature and contents of container

Ritalin tablet [10 mg]: blister packs containing 30 tablets

Ritalin LA capsules [10 mg, 20 mg, 30 mg and 40 mg]: HDPE bottles containing 30 or 100 capsules*

*Some presentations may not be available.

6.6. Special precautions for disposal and other handling

No special requirements.

7. Registration Holder and Importer

Novartis Israel Ltd., P.O.B. 7126, Tel Aviv.

8. Registration Numbers:

Ritalin 10 mg tablets - 113 76 22498

Ritalin LA 10 mg modified-release capsules - 146 50 33288

Ritalin LA 20 mg modified-release capsules - 130 61 30935

Ritalin LA 30 mg modified-release capsules - 130 60 30936

Ritalin LA 40 mg modified-release capsules - 130 59 30937

Revised in October 2026.